- Based on information provided by the coal mines, it is assumed that the majority of groundwater pumpage would come from the Wasatch Formation.

3.2 Power Plants

3.2.1 Past and Present Development

3.2.1.1 Wyoming

Currently, there are four coal-fired power plants in the PRB study area (see **Figure 3-1**). Black Hills Power Corporation owns and operates the Neal Simpson Units 1 and 2 (21.7-megawatts [MW] and 80-MW, respectively), WYGEN 1 (80-MW), and Wyodack (330-MW) power plants, all of which are located approximately 5 miles east of Gillette, Wyoming. Pacific Power and Light's Dave Johnston Power Plant is located near Glenrock, Wyoming, outside of but adjacent to the study area.

Hartzog, Arvada, and Barber Creek are three separate interconnected gas-fired power plants located near Gillette, Wyoming. Each contains three separate 5-MW rated turbines to provide electric power to Basin Electric and its customers. In winter, the maximum capacity can reach 22.6 MW from each site. All units are in operating condition, although they do not operate at maximum capacity.

3.2.1.2 Montana

The major existing coal-fired power plant in the Montana PRB study area is the Colstrip Power Plant, which is located near Colstrip, Montana, in Rosebud County (**Figure 3-1**). The facility consists of four separate coal-fired units on the same plant site. Units 1 and 2 are estimated at 450 MWs of power generation capacity each, and units 3 and 4 each are 778-MW design capacity. Recently, the facility received a permit to burn up to 28 percent petroleum coke in its Units 1 and 2 boilers, replacing coal as a fuel source.

A second smaller coal-fired power plant, the Colstrip Energy Limited facility, is in operation at a site approximately 1.5 miles north of Colstrip (**Figure 3-1**). The facility generally burns waste coal and has operated below maximum capacity in recent years. Permitting officials indicate that it has approximately 120 MW of electric generation capacity.

3.2.2 Reasonably Foreseeable Development

Coal-fired power plants have been, and likely would continue to be, constructed in the PRB to avoid high shipping costs for coal. Currently, adequate transmission line capacity exists to deliver the existing generating capacity to market; however, that capacity would need to be increased in order to provide adequate markets for new power plants.

Construction of new coal-fired power plants may involve some of the largest capital investments undertaken by industry, and substantial time would be required for obtaining permits and constructing such facilities. Recent estimates for a major coal-fired power plant are that a project

would require 2 to 4 years to obtain the required permits, with an additional 4 to 6 years for construction. An estimated development cost of over $1 billion would apply to most major coal-fired power plants (based on an estimated $1,500 per installed kilowatt [$1.5 million per installed MW] generating capacity). A workforce of up to 1,500 personnel would be required at peak construction, with a likely operating workforce of 100 to 150 for each operating plant, based on estimates from current operating facilities.

Air emissions from coal-fired power plants are undergoing intense scrutiny by regulatory agencies, environmental groups, and the general public. Recent proposed legislation in the U.S. Congress and proposed regulations by the USEPA may influence air emissions, including limits on carbon dioxide, which is not currently regulated; as of March 2005, mercury emissions are now regulated (USEPA 2005). Even a well-regulated facility would have major emissions of criteria air pollutants. For example, for a 1,000-MW plant using the Best Available Control Technology (BACT) for this industry, the estimate of sulfur dioxide and nitrogen oxides emissions would be approximately 2,500 tons per year for each pollutant. Particulate matter emissions likely would be 600 to 700 tons per year from the power plant stack, with additional fugitive and handling emissions for coal and waste. The air permit for each facility would need to demonstrate BACT for each of the major criteria air pollutants, including lead.

Water requirements for each coal-fired power plant would involve both a determination of the control technologies (wet scrubber versus dry scrubber for sulfur dioxide [SO_2]) and the facility cooling operations (wet or dry cooling towers, or a potential hybrid). An approximate estimate of the maximum water supply requirements for a wet scrubber and a wet cooling tower is 10,000 to 12,000 acre-feet per year for a typical 1,000-MW coal-fired power plant, based on recent analyses at other facilities.

3.2.2.1 Wyoming

Any proposed coal-fired power plant that plans to initiate operation by 2010 currently would have to be undergoing air permit review in order to obtain the required construction permits and complete construction by 2010. The following three identified projects currently are considered likely for 2010 development (**Figure 3-2**).

- Black Hills Power and Light's WYGEN 2 coal-fired unit located east of Gillette currently is under construction, with an estimated start date of 2008. As originally permitted, this unit has a planned production capacity of 500 MW and would consume approximately 2.8 million tons of coal per year. The facility would cover 60 acres within the existing 200-acre Black Hills Power and Light power plant area. Operation of this facility by 2010 is considered highly likely.

- North American Power Group has permitted a 250-MW coal-fired power plant (Two-Elk Unit 1) at a 40-acre site located approximately 15 miles southeast of Reno Junction (near Wright), Wyoming. As originally permitted, the project also would include installation of a 45-MW gas-fired turbine. The air permit originally was issued in August 2002; however, construction was suspended and the permit renewed, with actual startup expected in 2008. This unit would be dry-cooled, requiring very little water. Campbell County recently approved more than $123 million in industrial revenue bonds for application to the Two-Elk financing. Operation of this facility by 2010 is considered moderately likely.

- Basin Electric Power Cooperative is in the process of obtaining permits for a 250-MW coal-fired power plant near Gillette, Wyoming, but no specific site has been selected. The estimated startup date is 2010-2011. No design data are available at this time; however, based on current expected performance, it is estimated that 1.2 million tons of coal per year would be required to fuel the facility. The cooling technology also has not been finalized, but likely would involve a dry scrubber, since that type of operation commonly is installed for PRB coal-fired units. Operation of this facility by 2010 is considered moderately likely.

For 2015 and 2020, it is estimated that a maximum of one additional 700-MW coal-fired power plant would be constructed through 2020. It is assumed the additional unit, if developed, would be constructed in the Gillette area or near operating coal mines. The main restriction appears to be the lack of electric power transmission capacity from the area to customers outside the state. All existing power plants in the PRB region are assumed to remain operational through 2020.

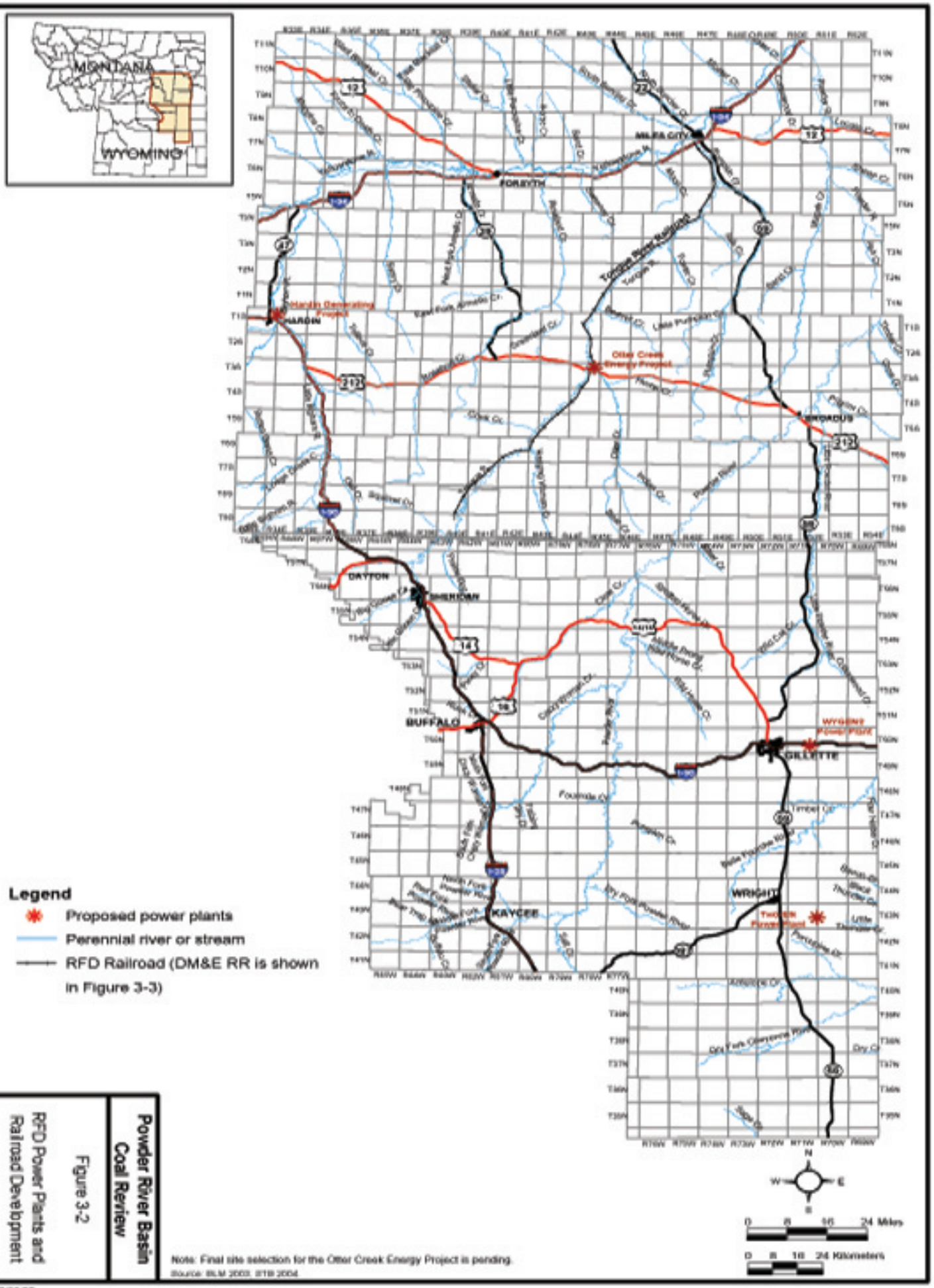
3.2.2.2 Montana

Two separate potential power plant developments currently have been approved or are under consideration by the MDEQ for sites in the Montana study area (**Figure 3-2**). All new power plant projects would be required, under air permitting rules, to install BACT on their air emissions. These current factors would be used to estimate emissions from any proposed new project. (For example 0.06 pounds per million British thermal unit [lb/MMBtu] for oxides of nitrogen [NO_x] and sulfur oxides [SO_x], and 0.025 lb/MMBtu for particulate matter with an aerodynamic diameter of 10 microns or less [PM_{10}] emissions controls.)

- A construction permit was issued for the Hardin Generation Project, at a site approximately 1.2 miles northeast of Hardin, Montana. This is a coal-fired boiler unit, with a capacity of 113 MWs of electric power. The facility currently is under construction; however, the permit is under appeal (Skibisky 2004). There currently is no enforcement action to cease construction while the appeal is resolved. Permitting issues may be resolved in time to allow production prior to 2010. For purposes of this study, this facility's operation in 2010 and future years is considered to be highly likely.

- The Otter Creek Energy Project is reviewing opportunities to install up to 3,000 MW of coal-fired power plant electric power generating capacity. Potential sites are near rail lines and coal properties near Ashland, Montana. An exact site and project size will be selected for modeling purposes, but it is likely that over the time frame of this study, the installed capacity would not reach the 3,000-MW generating capacity. It is expected that by 2010, there would be no new units installed at this site, and the lower projection scenario would involve only one 750-MW unit by 2015. The maximum expected capacity under the high projection scenario would be 1,500 MW (two 750-MW units) by 2020. No formal application has been submitted, and the project is considered a low likelihood for both 2015 and 2020.

One significant modification for coal use may occur at the Colstrip Power Plant. The facility has received an air permit to increase the capacity to burn petroleum coke in lieu of coal in its units 1 and 2 boilers. Up to 28 percent of the firing capacity can be fueled with petroleum coke, based on the recent permit application.



Note: Final site selection for the Otter Creek Energy Project is pending.

Source: BLM 2003, STB 2004

Powder River Basin Coal Review

Figure 3-2

RFD Power Plants and Railroad Development

07/20/05

By 2015, under the low development scenario, it is assumed that only the Hardin Generation Project and one 750-MW unit at the Otter Creek Energy Project would be constructed and operating. For the high development scenario, in addition to the Hardin Generation Project, it is assumed that two 750-MW units would be developed at or near the Otter Creek Project by 2020.

As discussed in Section 3.1.2.2, construction of a new power plant near Miles City, Montana, would be required for development of the Otter Creek Mine, and construction of a mine-mouth power plant would be required for development of the Kinsey Mine. However, due to the lack of permit applications or project-specific information, the likelihood for their development currently is unknown. As a result, they have been eliminated from further analysis in this study.

Bull Mountain Development Company has permitted the Roundup Power Project, a coal-fired power plant that would operate two 390-MW pulverized coal-fired boilers. This mine-mouth power plant would be located adjacent to the Bull Mountains Mine, approximately 12 miles south-southeast of Roundup, Montana and just east of U.S. Highway 87 in Musselshell County. As this power plant would be located greater than 30 miles west of the Montana PRB study area, the facility has been eliminated from further analysis.

3.2.3 Data Sources

Information relative to existing power plants in the Wyoming PRB study area was obtained from construction and operating permits on file with the WDEQ and direct contact with power plant operators. Data for existing power plants in the Montana PRB study area were obtained from the facility permits available through the MDEQ web site and from discussions with MDEQ staff.

Information relative to reasonably foreseeable power plants through 2010 was obtained from existing permit applications either under review or extended for a start of construction and news releases. Data also were obtained from each identified proponent (Black Hills Power and Light and North American Power Group). Data for the Hardin Generation Project were obtained from the facility permits available through the MDEQ web site and from discussions with MDEQ staff. Data for the Otter Creek Energy Project were obtained from a fact sheet provided by the potential developer.

3.2.4 Assumptions

In addition to the information obtained from the identified data sources, the following assumptions were used to define specific impact-causing parameters for power plants:

Past and Present Development:

- Surface disturbance associated with a typical power plant facility would be 60 to 200 acres, based on available acreage data from other power plants.

- Annual emissions for the Colstrip Power Plant would be 16,000 tons per year of SO_2, 32,000 ton per year of NO_x, and approximately 500 tons per year of PM_{10} from the main stacks.

RFD (2010):

- New power plants would comply with BACT for maximum controls.

- Existing power plants would be required to apply additional controls for NO_x, SO_2, PM_{10}, and particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$) in response to the regional haze rule.

- As originally permitted, annual emissions for the WYGEN 2 power plant would be 2,028 ton/year of NO_x, 3,381 ton/year of SO_2, and 421 ton/year of PM_{10}. Construction of the WYGEN 2 power plant would require a workforce of 750 to 1,000 construction workers, employed over a 4- to 5-year period, and an additional 75 to 100 employees for operations.

- As originally permitted, annual emissions for the Two-Elk Unit 1 power plant would be 1,756 ton/year of NO_x, 1,991 ton/year of SO_2, and 234 ton/year of PM_{10}. Project construction would occur over a 2-year period, with a temporary peak workforce of 750 workers. The estimated operating workforce would include 50 full-time equivalent staff. Total expected capital investment would be about $450 million.

- The Otter Creek Energy Project size could reach 2,000 acres, depending on design issues such as disposal of coal combustion wastes and local terrain limitations.

- Assume minimal added rail shipping and associated emissions.

RFD (2015 and 2020):

- Under the lower and upper coal production scenarios, it is assumed that three new coal-fired power plants (one 500-MW plant and two 250-MW plants) would be constructed in the Wyoming PRB study area by 2010. Under the upper production scenario, an additional 700-MW power plant also could be constructed by 2020.

- Under the lower coal production scenario, it is assumed that two new coal-fired power plants would be constructed in the Montana PRB study area (one 113-MW plant by 2010 and one 750-MW plant by 2015). Under the upper production scenario, it is assumed that one 113-MW plant would be constructed by 2010, and one 1,500-MW plant would be constructed by 2020.

- Construction of each power plant would require a workforce of 750 to 1,000 construction workers employed over a 4-year period. Each plant would require an estimated operating workforce of 75 to 100.

- New power plants would comply with BACT for maximum controls.

- For the proposed power plants, the modeling assumes representative stack parameters, such as a stack height of 500 feet, diameter of 30 feet, and temperature and flow rate similar to other coal-fired power plants with wet scrubbers.